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Design Data for *m*-Derived Type Filters

PART IX

By the Engineering Department, Aerovox Corporation

THE CIRCUIT Components Chart accompanying this article lists all capacitor and inductor values for *shunt-derived* band-suppression filter sections for twenty-three convenient mid frequencies from 100 cycles to 10 megacycles and twelve common bandwidths from 0.05 to 0.9. The constants may be taken directly from this chart, without having to make computations of any sort, when working with the specified mid frequencies and bandwidths. When the filter section is to operate at bandwidths or mid frequencies other than those listed, simple computations may be performed to obtain required values from those listed in the chart.

All chart listings are in henries and microfarads, except in the last three columns. In the 100-kc. column, listings are in millihenries and microfarads. In the 1- and 10-Mc. columns, listings are in millihenries and micromicrofarads.

As in the case of the series-derived sections (described in the last installment of this series of articles) and of band-pass sections, component values given in the chart have been calculated for a characteristic impedance of 500 ohms. However, L and C values corresponding to mid frequencies and characteristic impedances other than those specified in the chart may be obtained by interpolation. All component values so obtained will be inversely proportional to the new mid frequencies. The inductance values will be directly proportional and the capacitance values inversely proportional to the new characteristic impedance.

In determining values for operating conditions other than those specified by the chart, first locate on the chart the L and C values corresponding to 500 ohms impedance. Values corresponding to the desired new impedance of R ohms will then be equal to the 500-ohm inductance multiplied by R/500, and the 500-ohm capacitance value divided by R/500.

Circuit diagram of the shunt-derived band-suppression filter section is given in Figure 8 (originally published in Part I, September-October 1942 issue).

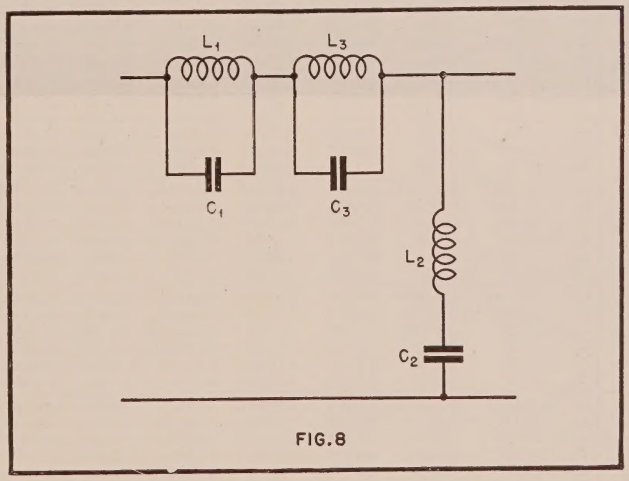

FIG. 8

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CHART 7 — Shunt-Derived Band-Suppression Filters (R=500 Ohms)

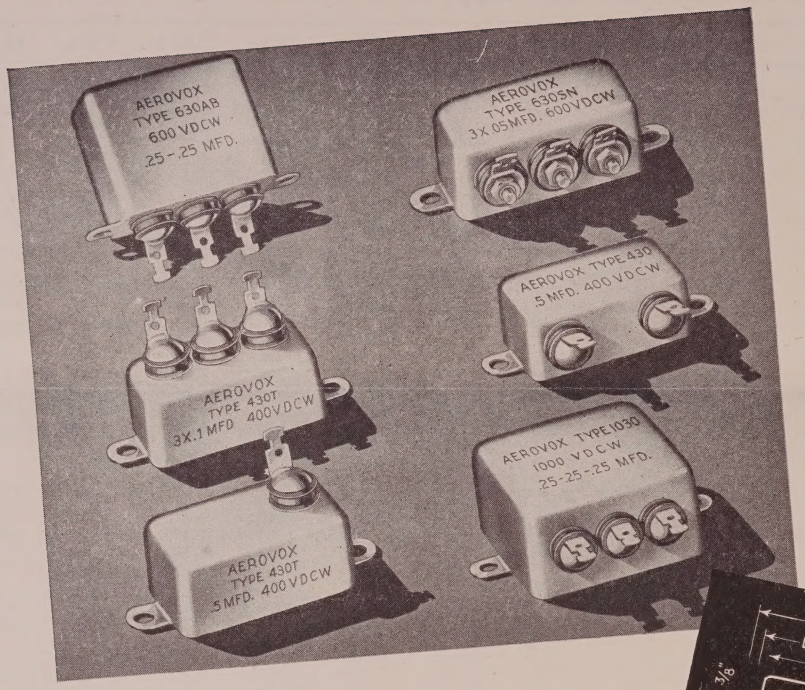
Band Width	f_m =	100	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
0.05	L_1	0.0408	0.00408	0.00272	0.00204	0.00163	0.00268	0.00115	0.00102	0.000906	0.000816	0.000738	0.000677
	L_2	7.58	0.758	0.5048	0.3790	0.3032	0.2524	0.2137	0.1895	0.1683	0.1516	0.1372	0.1258
	L_3	0.0431	0.00431	0.00287	0.00215	0.00172	0.00143	0.00121	0.00108	0.000957	0.000862	0.00078	0.000715
	C_1	59.1	5.91	3.936	2.455	2.364	1.968	1.667	1.477	1.312	1.182	1.069	0.9811
	C_2	0.335	0.0335	0.0223	0.0167	0.0134	0.0111	0.0094	0.00837	0.00744	0.00670	0.00606	0.00556
	C_3	62.2	6.22	4.142	3.110	2.488	2.071	1.754	1.555	1.381	1.244	1.126	1.032
0.1	L_1	0.0555	0.00555	0.00369	0.00277	0.00222	0.00185	0.00156	0.00139	0.00123	0.00111	0.0010	0.000921
	L_2	5.44	0.544	0.3623	0.2720	0.2176	0.1811	0.1534	0.1360	0.1207	0.1088	0.0985	0.0903
	L_3	0.0613	0.00613	0.00408	0.00306	0.00245	0.00204	0.00173	0.00153	0.00136	0.00123	0.00111	0.00102
	C_1	41.4	4.14	2.757	2.070	1.656	1.379	1.167	1.035	0.9191	0.8280	0.7493	0.6882
	C_2	0.467	0.0467	0.0311	0.0233	0.0187	0.0155	0.0132	0.0117	0.0104	0.00934	0.00845	0.00775
	C_3	45.8	4.58	3.0503	2.290	1.832	1.525	1.291	1.145	1.017	0.9160	0.8289	0.7603
0.15	L_1	0.0688	0.00688	0.00458	0.00344	0.00275	0.00229	0.00194	0.00172	0.00153	0.00138	0.00124	0.00114
	L_2	4.27	0.427	0.2844	0.2135	0.1708	0.1422	0.1204	0.1067	0.0948	0.0854	0.0773	0.0709
	L_3	0.0803	0.00803	0.00535	0.00401	0.00321	0.00267	0.00226	0.00201	0.00178	0.00161	0.00145	0.00133
	C_1	31.7	3.17	2.111	1.585	1.268	1.056	0.8939	0.7925	0.7037	0.6340	0.5738	0.5262
	C_2	0.594	0.0594	0.0396	0.0297	0.0237	0.0198	0.0167	0.0148	0.0132	0.0119	0.0107	0.00986
	C_3	36.9	3.69	2.457	1.345	1.476	1.229	1.0406	0.9225	0.8192	0.7380	0.6679	0.6125
0.2	L_1	0.0810	0.00810	0.00539	0.00405	0.00324	0.00269	0.00228	0.00202	0.00179	0.00162	0.00147	0.00134
	L_2	3.53	3.53	0.2351	0.1765	0.1412	0.1175	0.0995	0.0882	0.0784	0.0706	0.0639	0.0586
	L_3	0.0988	0.00988	0.00658	0.00494	0.00395	0.00329	0.00278	0.00247	0.00219	0.00198	0.00179	0.00164
	C_1	25.7	2.57	1.712	1.285	1.028	0.8558	0.7247	0.6425	0.5705	0.5140	0.4652	0.4266
	C_2	0.719	0.0719	0.0479	0.0359	0.0288	0.0239	0.0203	0.0179	0.0159	0.0144	0.0130	0.0119
	C_3	31.3	3.13	2.084	1.565	1.252	1.042	0.8827	0.7825	0.6949	0.6260	0.5665	0.5196
0.25	L_1	0.0925	0.00925	0.00616	0.00462	0.00370	0.00308	0.00261	0.00231	0.00205	0.00185	0.00167	0.00153
	L_2	3.01	0.301	0.2008	0.1505	0.1204	0.1004	0.0849	0.0752	0.0668	0.0602	0.0545	0.0499
	L_3	0.1190	0.01190	0.00792	0.00595	0.00476	0.00396	0.00335	0.00297	0.0026	0.00238	0.00215	0.00197
	C_1	21.2	2.12	1.412	1.060	0.8480	0.7059	0.5978	0.5300	0.4706	0.4240	0.3837	0.3519
	C_2	0.844	0.0844	0.0562	0.0422	0.0338	0.0281	0.0238	0.0211	0.0187	0.0169	0.0153	0.0140
	C_3	27.5	2.75	1.831	1.375	1.100	0.9157	0.7755	0.6875	0.6105	0.5500	0.4977	0.4565
0.3	L_1	0.1028	0.01028	0.00685	0.00514	0.00411	0.0034	0.00289	0.00257	0.00228	0.00206	0.00186	0.00171
	L_2	2.63	0.263	0.1751	0.1315	0.1052	0.0875	0.0742	0.0657	0.0584	0.0526	0.0466	0.0436
	L_3	0.1388	0.01388	0.00924	0.00694	0.00555	0.00462	0.00391	0.00347	0.00308	0.00278	0.0025	0.00230
	C_1	18.32	1.832	1.220	0.9160	0.7228	0.6100	0.5166	0.4580	0.4067	0.3664	0.3116	0.3041
	C_2	0.964	0.0964	0.0642	0.0482	0.0386	0.0321	0.0272	0.0241	0.0214	0.0193	0.0174	0.0160
	C_3	24.7	2.47	1.645	1.235	0.9880	0.8225	0.6965	0.6175	0.5483	0.4940	0.4471	0.4100
0.4	L_1	0.1205	0.01205	0.00802	0.00602	0.00482	0.00401	0.00339	0.00301	0.00267	0.00241	0.00218	0.0020
	L_2	2.12	0.212	0.1412	0.1060	0.0848	0.0706	0.0598	0.0530	0.0470	0.00424	0.0384	0.0352
	L_3	0.1800	0.0180	0.0119	0.0090	0.00720	0.00599	0.0051	0.0045	0.00399	0.00360	0.00306	0.00299
	C_1	14.12	1.412	0.9404	0.7060	0.5648	0.4702	0.3982	0.3530	0.3135	0.2824	0.2556	0.2344
	C_2	1.20	0.120	0.0799	0.0600	0.0480	0.0399	0.0338	0.0300	0.0266	0.0240	0.0217	0.0199
	C_3	21.1	2.110	1.405	1.055	0.8440	0.7026	0.5950	0.5275	0.4684	0.4220	0.3819	0 3503
0.5	L_1	0.1352	0.01352	0.0090	0.00676	0.00541	0.0045	0.00381	0.00338	0.00300	0.00270	0.00245	0.00224
	L_2	1.778	0.1778	0.1184	0.0889	0.0711	0.0542	0.0501	0.0444	0.0395	0.0356	0.0322	0.0295
	L_3	0.222	0.0222	0.0148	0.0111	0.00888	0.0074	0.00626	0.00555	0.00492	0.00444	0.00402	0.00368
	C_1	11.44	1.144	0.7619	0.5720	0.4576	0.3809	0.3226	0.2860	0.2539	0.2289	0.2071	0.1899
	C_2	1.427	0.1427	0.0950	0.0713	0.0571	0.0475	0.0402	0.0357	0.0317	0.0384	0.0258	0.0237
	C_3	18.8	1.88	1.252	0.9400	0.7520	0.6260	0.5302	0.4700	0.4174	0.3760	0.3403	0.3121
0.6	L_1	0.1470	0.01470	0.00979	0.00735	0.00588	0.00484	0.00414	0.00367	0.00326	0.00294	0.00266	0.00244
	L_2	1.542	0.1542	0.1027	0.0771	0.0617	0.0513	0.0435	0.0385	0.0342	0.0308	0.0279	0.0251
	L_3	0.266	0.0266	0.0177	0.0133	0.0106	0.00886	0.0075	0.00665	0.00590	0.00532	0.00481	0.00441
	C_1	9.56	0.956	0.6367	0.4780	0.3824	0.3183	0.2696	0.2390	0.2122	0.1912	0.1720	0.1587
	C_2	1.647	0.1647	0.1097	0.0823	0.0659	0.0548	0.0464	0.0412	0.0366	0.0329	0.0298	0.0273
	C_3	17.28	1.728	1.151	0.8640	0.6912	0.5754	0.4673	0.4320	0.3836	0.3456	0.3128	0.2868
0.7	L_1	0.1565	0.01565	0.0104	0.00782	0.00626	0.00521	0.00441	0.00391	0.00347	0.00313	0.00283	0.00259
	L_2	1.360	0.1360	0.0906	0.0680	0.0544	0.0453	0.0383	0.0340	0.0302	0.0272	0.0246	0.0226
	L_3	0.309	0.0309	0.0206	0.0154	0.0124	0.0103	0.00871	0.00772	0.00686	0.00618	0.00559	0.00513
	C_1	8.20	0.820	0.5461	0.4100	0.3280	0.2731	0.2312	0.2050	0.1820	0.1640	0.1484	0.1361
	C_2	1.867	0.1867	0.1243	0.0933	0.0747	0.0622	0.0525	0.0467	0.0414	0.0373	0.0348	0.0309
	C_3	16.24	1.624	1.081	0.8120	0.6496	0.5408	0.4579	0.4060	0.3605	0.3248	0.2939	0.2696
0.8	L_1	0.1638	0.01638	0.0109	0.00819	0.00655	0.00545	0.00462	0.00409	0.00364	0.00328	0.00296	0.00272
	L_2	1.222	0.1222	0.0814	0.0611	0.0489	0.0407	0.0345	0.0305	0.0271	0.0244	0.0221	0.0203
	L_3	0.357	0.0357	0.0238	0.0178	0.0143	0.0119	0.0101	0.00892	0.00792	0.00714	0.00646	0.00593
	C_1	7.12	0.712	0.4742	0.3560	0.2848	0.2371	0.2008	0.1780	0.1581	0.1424	0.1289	0.1182
	C_2	2.08	0.208	0.1385	0.1040	0.0832	0.0693	0.0586	0.0420	0.0462	0.0416	0.0376	0.345
	C_3	15.52	1.552	1.034	0.7760	0.6208	0.5168	0.4377	0.3880	0.3445	0.3104	0.2809	0.2576
0.9	L_1	0.1682	0.01682	0.0112	0.00841	0.00673	0.0056	0.0047	0.00420	0.00373	0.00336	0.00304	0.00279
	L_2	1.110	0.1110	0.0739	0.0555	0.0444	0.0369	0.0313	0.0277	0.0246	0.022	0.0201	0.0184
	L_3	0.403	0.0403	0.0268	0.0201	0.0161	0.0134	0.0114	0.0101	0.00895	0.0080	0.00729	0.00669
	C_1	6.300	0.6300	0.4196	0.3150	0.2520	0.2098	0.1777	0.1575	0.1399	0.1260	0.1140	0.1046
	C_2	2.29	0.229	0.1525	0.1145	0.0916	0.0762	0.0646	0.0572	0.0508	0.0458	0.0414	0.0380
	C_3	15.08	1.508	1.004	0.7540	0.6032	0.5022	0.4252	0.3770	0.3348	0.3016	0.2729	0.2503

C: Mmfds. in last two columns. **L:** Millihenries in last three columns. Mfds. and Henries in all other columns.

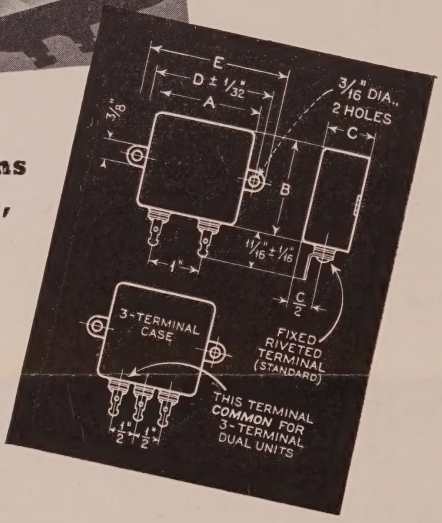
CHART 7 — Shunt-Derived Band-Suppression Filters (R=500 Ohms)

Band Width	f_m =	6500	7000	7500	8000	8500	9000	9500	10 kc.	100 kc.	1 Mc.	10 Mc.
0.05	L_1	0.000624	0.000575	0.000542	0.000510	0.000477	0.000452	0.000428	0.000408	0.0408	0.00408	0.000408
	L_2	0.1159	0.1069	0.1008	0.0947	0.0887	0.0841	0.0796	0.0758	7.58	0.758	0.0758
	L_3	0.000659	0.000607	0.000573	0.000539	0.000504	0.000478	0.000452	0.000431	0.0431	0.00431	0.000431
	C_1	0.9042	0.8333	0.7860	0.7387	0.6915	0.6560	0.6205	0.591	0.0591	5910.0	59.1
	C_2	0.00512	0.00472	0.00445	0.00419	0.00392	0.00372	0.00352	0.00335	0.000335	33.5	3.35
	C_3	0.9517	0.8770	0.8273	0.7775	0.7277	0.6904	0.6531	0.622	0.0622	6220	62.2
0.1	L_1	0.000849	0.000782	0.000738	0.000694	0.000649	0.000616	0.000582	0.000555	0.0555	0.00555	0.000555
	L_2	0.0832	0.0767	0.0723	0.0680	0.0636	0.0604	0.0571	0.0544	5.44	0.544	0.0544
	L_3	0.000937	0.000864	0.000815	0.000766	0.000717	0.000680	0.000643	0.000613	0.0613	0.00613	0.000613
	C_1	0.6334	0.5837	0.5506	0.5175	0.4844	0.4595	0.4347	0.414	0.0414	4140	414
	C_2	0.00714	0.00658	0.00621	0.00584	0.00546	0.00518	0.00490	0.00467	0.000467	46.7	4.67
	C_3	0.7007	0.6458	0.6091	0.5725	0.5359	0.5084	0.4809	0.458	0.0458	4580	458
0.15	L_1	0.00105	0.000970	0.000915	0.000860	0.000804	0.000763	0.000722	0.000688	0.0688	0.00688	0.000688
	L_2	0.0653	0.0602	0.0568	0.0534	0.0499	0.0474	0.0448	0.0427	4.27	0.427	0.0427
	L_3	0.00123	0.00113	0.00107	0.00100	0.000939	0.000891	0.000843	0.000803	0.0803	0.00803	0.000803
	C_1	0.4850	0.4469	0.4216	0.3962	0.3709	0.3519	0.3328	0.317	0.0317	3170	317
	C_2	0.00909	0.00837	0.00790	0.00742	0.00695	0.00659	0.00624	0.00594	0.000594	59.4	5.94
	C_3	0.5646	0.5203	0.4908	0.4612	0.4317	0.4096	0.3874	0.369	0.0369	3690	369
0.2	L_1	0.00124	0.0114	0.00108	0.00101	0.000947	0.000899	0.000850	0.000810	0.0810	0.00810	0.000810
	L_2	0.0540	0.0498	0.0469	0.0441	0.0413	0.0392	0.0371	0.0353	3.53	0.353	0.0353
	L_3	0.00151	0.00139	0.00131	0.00123	0.00115	0.00109	0.00104	0.000988	0.0988	0.00988	0.000988
	C_1	0.3932	0.3624	0.3418	0.3212	0.3007	0.2853	0.2698	0.257	0.0257	2570	257
	C_2	0.0110	0.0101	0.00956	0.00898	0.00841	0.00798	0.00755	0.00719	0.000719	7190	719
	C_3	0.4789	0.4413	0.4163	0.3912	0.3662	0.3474	0.3286	0.313	0.0313	3130	313
0.25	L_1	0.00141	0.00130	0.00123	0.00116	0.00108	0.00103	0.000971	0.000925	0.0925	0.00925	0.000925
	L_2	0.0460	0.0424	0.0400	0.0376	0.0352	0.0334	0.0316	0.0301	3.010	0.3010	0.0301
	L_3	0.00182	0.00168	0.00158	0.00149	0.00139	0.00132	0.00125	0.001190	0.119	0.0119	0.00119
	C_1	0.3244	0.2989	0.2820	0.2650	0.2480	0.2353	0.2226	0.212	0.0212	2120	212
	C_2	0.0129	0.0119	0.0112	0.0105	0.00987	0.00937	0.00886	0.00844	0.000844	8440	844
	C_3	0.4207	0.3877	0.3657	0.3437	0.3217	0.3052	0.2887	0.275	0.0275	2750	275
0.3	L_1	0.00157	0.00145	0.00137	0.00128	0.00120	0.00114	0.00108	0.001028	0.1028	0.01028	0.001028
	L_2	0.0402	0.0371	0.0349	0.0329	0.0308	0.0292	0.0276	0.0263	2.63	0.263	0.0263
	L_3	0.0021	0.00196	0.00185	0.00173	0.00162	0.00154	0.00146	0.001388	0.1388	0.01388	0.001388
	C_1	0.2803	0.2583	0.2436	0.2290	0.2143	0.2033	0.1924	0.1832	0.01832	1832	183.2
	C_2	0.0147	0.0136	0.0128	0.0120	0.0113	0.0107	0.0101	0.00964	0.000964	9.64	0.964
	C_3	0.3779	0.3483	0.3285	0.3087	0.2889	0.2742	0.2593	0.247	0.0247	2470	247
0.4	L_1	0.00184	0.00169	0.00160	0.00150	0.0014	0.00134	0.00126	0.001205	0.1205	0.01205	0.001205
	L_2	0.0324	0.0299	0.0282	0.0265	0.0248	0.0235	0.0223	0.0212	2.12	0.212	0.0212
	L_3	0.00275	0.00254	0.00239	0.00225	0.0021	0.00199	0.00189	0.00180	0.1800	0.0180	0.00180
	C_1	0.2160	0.1991	0.1878	0.1765	0.1652	0.1567	0.1483	0.1412	0.01412	1412	141.2
	C_2	0.0184	0.0169	0.0159	0.0150	0.0140	0.0133	0.0126	0.0120	0.0012	120	12.0
	C_3	0.3228	0.2975	0.2806	0.2637	0.2469	0.2342	0.2215	0.211	0.0211	2110	211
0.5	L_1	0.0021	0.00191	0.00179	0.00169	0.00159	0.00150	0.00142	0.001352	0.1352	0.01352	0.001352
	L_2	0.0272	0.0251	0.0236	0.0222	0.0208	0.0197	0.0187	0.01778	1.778	0.1778	0.01778
	L_3	0.00339	0.0031	0.00295	0.00277	0.00259	0.00246	0.00233	0.00222	0.222	0.0222	0.00222
	C_1	0.1750	0.1613	0.1521	0.1430	0.1338	0.1269	0.1201	0.1144	0.01144	1144	114.4
	C_2	0.0218	0.0201	0.0189	0.0178	0.0167	0.0158	0.0150	0.01427	0.001427	142.7	14.27
	C_3	0.2876	0.2651	0.2500	0.2350	0.2199	0.2087	0.1974	0.188	0.0188	1880	188.0
0.6	L_1	0.00225	0.00207	0.00195	0.00184	0.00172	0.00163	0.00154	0.001470	0.1470	0.01470	0.00147
	L_2	0.0236	0.0217	0.0205	0.0193	0.0180	0.0171	0.0162	0.01542	1.542	0.1542	0.01542
	L_3	0.00407	0.00375	0.00354	0.00332	0.00311	0.00295	0.00279	0.00266	0.266	0.0266	0.00266
	C_1	0.1463	0.1348	0.1271	0.1195	0.1118	0.1061	0.1004	0.0956	0.00956	956	95.6
	C_2	0.0252	0.0232	0.0219	0.0206	0.0193	0.0183	0.0173	0.01647	0.001647	164.7	16.47
	C_3	0.2644	0.2436	0.2298	0.2160	0.2022	0.1918	0.1814	0.1728	0.01728	1728	172.8
0.7	L_1	0.00240	0.00221	0.00208	0.00196	0.00183	0.00174	0.00164	0.001565	0.1565	0.01565	0.001565
	L_2	0.0208	0.0192	0.0181	0.0170	0.0159	0.0151	0.0143	0.01360	1.360	0.1360	0.01360
	L_3	0.00473	0.00436	0.00411	0.00386	0.0036	0.00343	0.00324	0.00309	0.309	0.0309	0.00309
	C_1	0.1255	0.1156	0.10910	0.1025	0.0959	0.0910	0.0861	0.0820	0.00820	820	82.0
	C_2	0.0286	0.0263	0.0248	0.0233	0.0218	0.0207	0.0196	0.01867	0.001867	186.7	18.67
	C_3	0.2485	0.2289	0.2159	0.2030	0.1900	0.1803	0.1705	0.1624	0.01624	1624	162.4
0.8	L_1	0.00251	0.00231	0.00218	0.00205	0.00192	0.00182	0.00172	0.001638	0.1638	0.01638	0.001638
	L_2	0.0187	0.0172	0.0162	0.0153	0.0143	0.0136	0.0128	0.01222	1.222	0.1222	0.01222
	L_3	0.0055	0.0050	0.00475	0.00446	0.00418	0.00396	0.00375	0.00357	0.3570	0.03570	0.00357
	C_1	0.1089	0.1004	0.0947	0.0890	0.0833	0.0790	0.0748	0.0712	0.00712	712	71.2
	C_2	0.0318	0.0293	0.0277	0.0260	0.0243	0.0231	0.0218	0.0208	0.00208	208	20.8
	C_3	0.2374	0.2188	0.2064	0.1940	0.1816	0.1723	0.1630	0.1552	0.01552	155.2	15.52
0.9	L_1	0.00257	0.00237	0.00224	0.0021	0.00197	0.00187	0.00177	0.001682	0.1682	0.01682	0.001682
	L_2	0.0169	0.0156	0.0148	0.0139	0.0129	0.0123	0.0116	0.01110	1.11	0.111	0.0111
	L_3	0.00616	0.0057	0.00536	0.00504	0.00471	0.00447	0.0042	0.00403	0.403	0.0403	0.00403
	C_1	0.0964	0.0888	0.0838	0.0787	0.0737	0.0699	0.0661	0.0630	0.00630	630	63.0
	C_2	0.0350	0.0323	0.0304	0.0286	0.0268	0.0254	0.0240	0.0229	0.00229	229	22.9
	C_3	0.2307	0.2126	0.2006	0.1885	0.1764	0.1674	0.1583	0.1508	0.01508	150.8	15.08

C: Mmfds. in last two columns. **L:** Millihenries in last three columns. Mfds. and Henries in all other columns.



ARMY E NAVY



Meeting the severe operating conditions encountered in military, aircraft, police, broadcast, P-A and other equipment...

HYVOL "BATHTUB" *Capacitors*

● These drawn-container units are designed for applications requiring compact, extra-quality capacitors. Aerovox Type 30 capacitors are specified for equipment that must undergo severe-service operating conditions, more particularly in military, aircraft, police, broadcast, public-address, and other classes of communications equipment, as well as in electronic assemblies operating hour after hour. These "bathtubs" are standard capacitors in Government radio and electronic equipment.

Type 30 is Hyvol impregnated and filled. Type 30M is mineral-oil impregnated and filled. One-piece drawn metal case with soldered bottom plate. Terminals are constructed with the Aerovox-originated "double-rubber" bakelite insulators permanently riveted to the case, making a sturdy, *absolutely* immersion-proof assembly. Terminals on side, top, bottom or ends to suit mounting and wiring requirements.

In 400, 600 and 1000 v. D.C.W. Choice of capacitances. Single, dual and triple sections.

● Write for descriptive literature and listings.